North Fork Blackfoot River Native Fish Restoration Project

Draft Environmental Assessment of Pilot-Level Bioassays and Fish Distribution Testing for the Proposed North Fork Blackfoot River Native Fish Restoration Project **2018**

Authors

Pat Clancey
Ron Pierce
Don Skaar
Carol Endicott

MONTANA FISH, WILDLIFE & PARKS

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Executive Summary

We propose to conduct several actions to facilitate implementation of a proposed native fish restoration and conservation project in the North Fork Blackfoot River, within the Scapegoat Wilderness (Figure 1). Eventual native fish restoration and conservation would require removing the existing fishery comprised of hybrids of Rainbow Trout, Yellowstone Cutthroat Trout, and Westslope Cutthroat Trout, followed by translocation of Westslope Cutthroat Trout and Bull Trout into the project area. CFT Legumine™ is a commonly used formulation of rotenone, a naturally-derived piscicide, used in stream reclamation in Montana, and would likely be used in the North Fork Blackfoot River project area. This draft environmental assessment (EA) covers collection of baseline data in 2018 to be used in planning for proposed basin-wide fish eradication beginning in 2019. The project area makes an ideal setting for conservation of native trout, as it is protected from reinvasion of fish by a barrier falls and is within a climate shield that should provide suitable habitat in a changing climate.

Currently, the headwaters of the North Fork Blackfoot River are a source of nonnative genes threatening nonhybridized Westslope Cutthroat Trout downstream of the project area. Moreover, these hybrids have a predominant contribution of genes from Rainbow Trout, which are poorly suited to the cold waters in the project area, resulting in low densities and poor angling opportunities. Translocation of Bull Trout into the project area would provide this threatened species a secure watershed with a diversity of habitats, cold water temperatures, and connectivity. Likewise, the overall project would provide a secure area of Westslope Cutthroat Trout. Combined, establishment of the native fish assemblage in the project area would bring considerable conservation and recreational benefits.

This draft EA considered 4 alternatives, no action, the proposed action, which is evaluated here in detail, and 2 other options: conducting the proposed actions in 2019 or conducting only 1 of the 4 investigations in 2018. The proposed action includes applying rotenone and a nontoxic dye to select tributaries, which would allow determination of the following: distribution of fish, stream travel time, the duration rotenone remains lethal in these streams, the concentration of rotenone required to achieve a fish kill, while minimizing impacts on nontarget organisms, spacing of drip stations, and concentration of potassium permanganate ($KMnO_4$), the deactivating chemical, required. The results would guide planning for the proposed next phase, which is removal of the existing fishery, followed by translocation of native Bull Trout and Westslope Cutthroat Trout into the project area. The other 3 alternatives were not considered in detail, as they would not provide conservation benefit, or would not provide sufficient information for planning for the proposed next phase.

Review of the potential effects of the proposed actions found this effort would have short-term and minor effects on the natural environment. CFT Legumine would be lethal to fish in the treated streams, as is the intent. Some aquatic invertebrates would suffer lethal response to rotenone, but many species would not be affected, and aquatic invertebrate communities recover quickly from disturbance, usually within a year. Likewise, the amphibians present in the project area would experience short-term and minor effects. Otherwise, mammals, birds, and reptiles would have exceptionally low and short-term exposure, which would be well below concentrations that would result in short-term or long-term effects on their health.

Effects on humans include the presence of fieldworkers in remote wilderness and the potential for exposure to rotenone. This work would require crews of 4 fieldworkers, who would be working in remote, off-trail parts of the watershed. Visitors to the Scapegoat Wilderness may encounter workers traveling on foot or by horseback, or at established campsites; however, the project would likely last 4 to 5 days, and presence of biologists collecting field data has been ongoing in the project area. Fieldworkers handling and applying CFT Legumine would be protected from exposure through use of personal protective equipment and training. Angling opportunities would not be affected with this phase of the project, as the streams proposed for study are small streams with low fish densities, and they receive little fishing pressure. The streams proposed for bioassays would be closed during treatment, which would last 1 day per stream.

The project would bring many benefits. The data collected through this effort would guide planning for the next proposed phase of the project, which is removing the existing fishery and translocating Westslope Cutthroat Trout and Bull Trout to the project area. The immediate benefit is collection of data to facilitate effective removal of the existing fishery if the removal project is implemented. Furthermore, the project would contribute to implementation of a native fish conservation project with tremendous conservation benefit. Westslope Cutthroat Trout and Bull Trout would have a secure refuge from nonnative species within an area predicted to provide suitable habitat that would be resilient to climate change.

A **public meeting** will be held on June 6, 2018 at the Hilton Garden Inn (Bitterroot Room; 3270 North Reserve) in Missoula at 6:30 p.m., to explain the project, answer questions, and take public testimony.

Public review of and comment on this project is encouraged, and the 30-day **public comment period** will begin May 30 and comments must be received no later than June 28, 2018.

The draft EA will be posted on FWP's website http://fwp.mt.gov (under "News," choose "Recent Public Notices") beginning May 30, 2018, along with the opportunity to submit comments online.

Submit written comments on the website above or to:

Sharon Rose
FWP Region 2
3201 Spurgin Road
Missoula, MT 59804
(406) 542-5540
shrose@mt.gov

Part I: Proposed Action

A. Type of Proposed Action

The proposed action is a planning phase to guide implementation of a native fish conservation project in the North Fork Blackfoot River upstream of a barrier falls, known locally as North Fork Falls (Figure 1). Westslope Cutthroat Trout and Bull Trout are the fish proposed to be translocated into the project area. Westslope Cutthroat Trout are a species of concern and have experienced substantial declines in abundance and distribution. Bull Trout have also declined, resulting in their listing as a threatened species under the Endangered Species Act. The objectives of this phase are to collect data to estimate fish distribution, calculate the volume of CFT Legumine solution and potassium permanganate required to meet overall project goals, and determine spacing of drip stations releasing CFT Legumine. The draft EA addresses the potential impacts of releasing CFT Legumine and potassium permanganate on a limited scale in selected stream reaches and other disturbance associated with presence of fieldworkers implementing the project.

Removal of the existing fishery and translocation of Westslope Cutthroat Trout and Bull Trout would provide a secure refuge for these sensitive and declining species. Moreover, the current fishery is poorly adapted to this high elevation environment and does not provide high quality fishing opportunities. Reestablishment of Westslope Cutthroat Trout, which were likely present historically, and introduction of Bull Trout would create a haven for the native assemblage of coevolved species, including fish, amphibians, and aquatic invertebrates. Reconnaissance field investigations proposed under this draft EA would provide information to guide effective removal of the nonnative hybrids, while minimizing effects on other aspects of the natural environment, recreation, and human health.

B. Agency Authority for the Proposed Action

The Montana Annotated Code 87-1-702 details the power of FWP relating to fish restoration and management as follows:

> The department is hereby authorized to perform such acts as may be necessary to the establishment and conduct of fish restoration and management projects as defined and authorized by the act of congress, provided every project initiated under the provisions of the act shall be under the supervision of the department, and no laws or rules or regulations shall be passed, made, or established relating to said fish restoration and management projects except they be in conformity with the laws of the State of Montana or rules promulgated by the department, and the title to all lands acquired or projects created from lands purchased or acquired by deed or gift shall vest in, be, there remain in the State of Montana and shall be operated and maintained by it in accordance with the laws of the State of Montana. The department shall have no power to accept benefits, unless the fish restoration and management projects created or established shall wholly and permanently belong to the State of Montana, except as hereinafter provided.

C. Estimated Commencement Date

The project is proposed to begin July 2018.

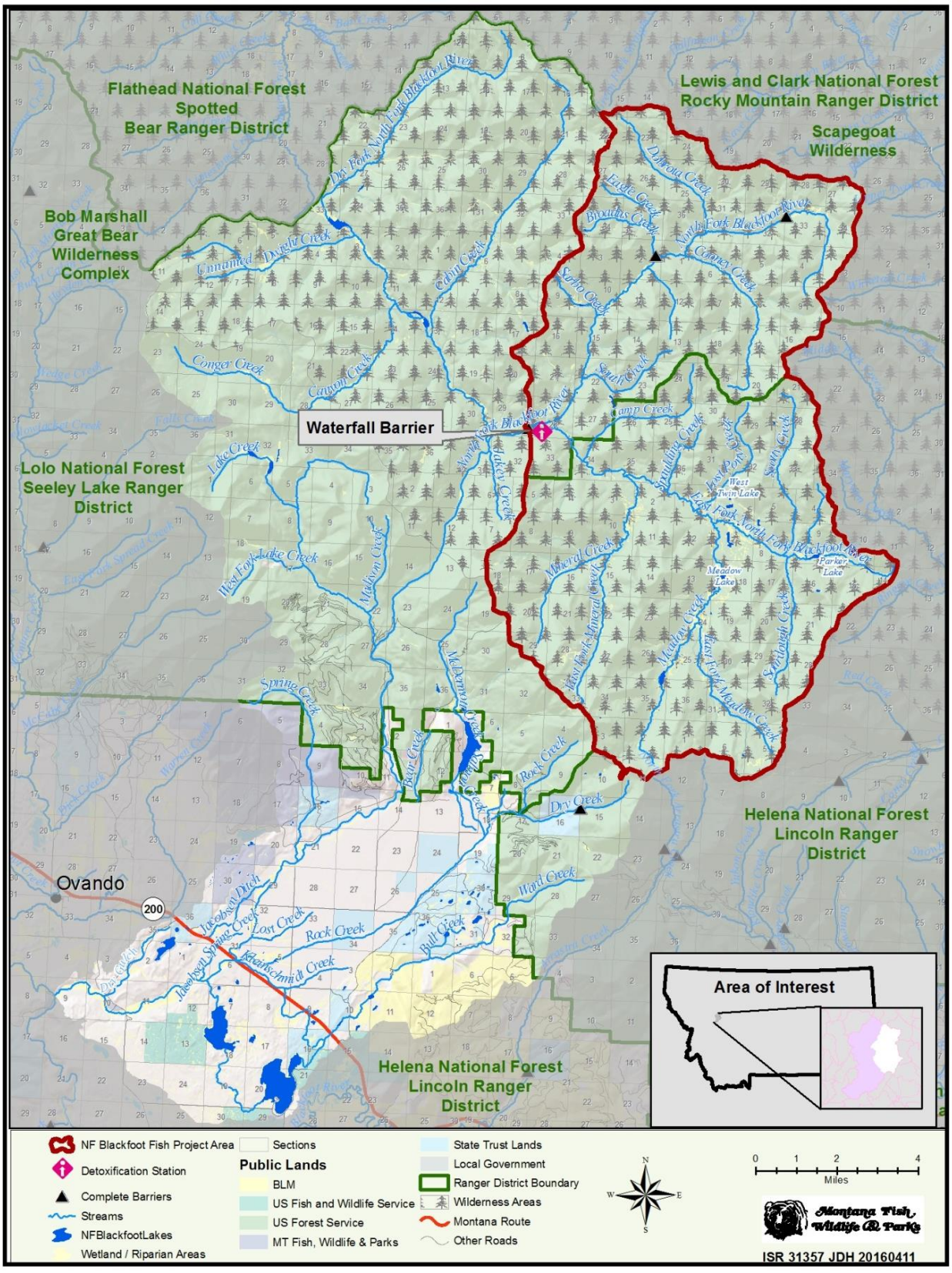

Figure 1. Map of the North Fork Blackfoot River watershed and delineation of project area.

D. Name and Location of the Project

The name of the project is Pilot-Level Bioassays and Fish Distribution Testing for the Proposed North Fork Blackfoot River. The project site is in Lewis and Clark County, approximately 15 miles northwest from Lincoln, MT (Figure 1). The streams are in Scapegoat Wilderness, which is within the Helena-Lewis & Clark and Lolo national forests.

1. Project Size (acres affected)
2. Developed/residential – 0 acres
3. Industrial - 0 acres
4. Open space/woodlands/recreation
5. Wetlands/riparian – to be determined

The specific streams to be tested have not been determined, but example locations are shown in Figure 2. The length of each stream that would be exposed to CFT Legumine or potassium permanganate would vary with travel time and duration of toxicity. Factors such as flow, habitat complexity, and gradient affect travel time, and deactivation of rotenone varies with water temperature and water chemistry.

E. Narrative Summary of the Proposed Action and Purpose of the Proposed Action

In preparation for the potential 2019 implementation of the North Fork Blackfoot River Native Fish Restoration Project, we propose to collect field data to facilitate the following actions:

- Calculate more precise estimates of the quantity of the piscicide CFT Legumine and potassium permanganate necessary to conduct the project, which would provide useful information toward determining the most efficient and acceptable method of transporting these supplies;
- Determine the concentration and frequency of application of the piscicide necessary to achieve the project goal of eradication of the hybridized fishery;
- Estimate the concentration of deactivating agent necessary to detoxify the stream; and
- Assist in planning for crew distribution and camping site locations

Bioassays

We propose to conduct bioassays in several headwater tributaries of the East Fork North Fork Blackfoot River in the Helena-Lewis & Clark National Forest (Figure 2) to assess how the piscicide and the deactivating agent would perform. Deactivation of these chemicals varies with habitat, water chemistry, temperature, dilution, and organic loading, and these factors vary within and across watersheds. Bioassays are required before full-scale application of the piscicide following the rotenone label instructions.

Bioassays are field studies of toxicity of varying concentrations of chemicals and the duration chemicals remain lethal to fish in receiving waters. Bioassays would be conducted for CFT Legumine and potassium permanganate. Two types of bioassay for CFT Legumine occur simultaneously – the travel time and serial dilution bioassays. Combined, the bioassays provide information to develop treatment protocols and allow estimation of the amount of residual rotenone at the terminal end of each treatment interval. Moreover, the results would refine estimates of the amount of rotenone required to treat streams throughout the project area and develop an estimate of the quantity of potassium permanganate required to deactivate rotenone during the proposed basin-wide native species conservation project.

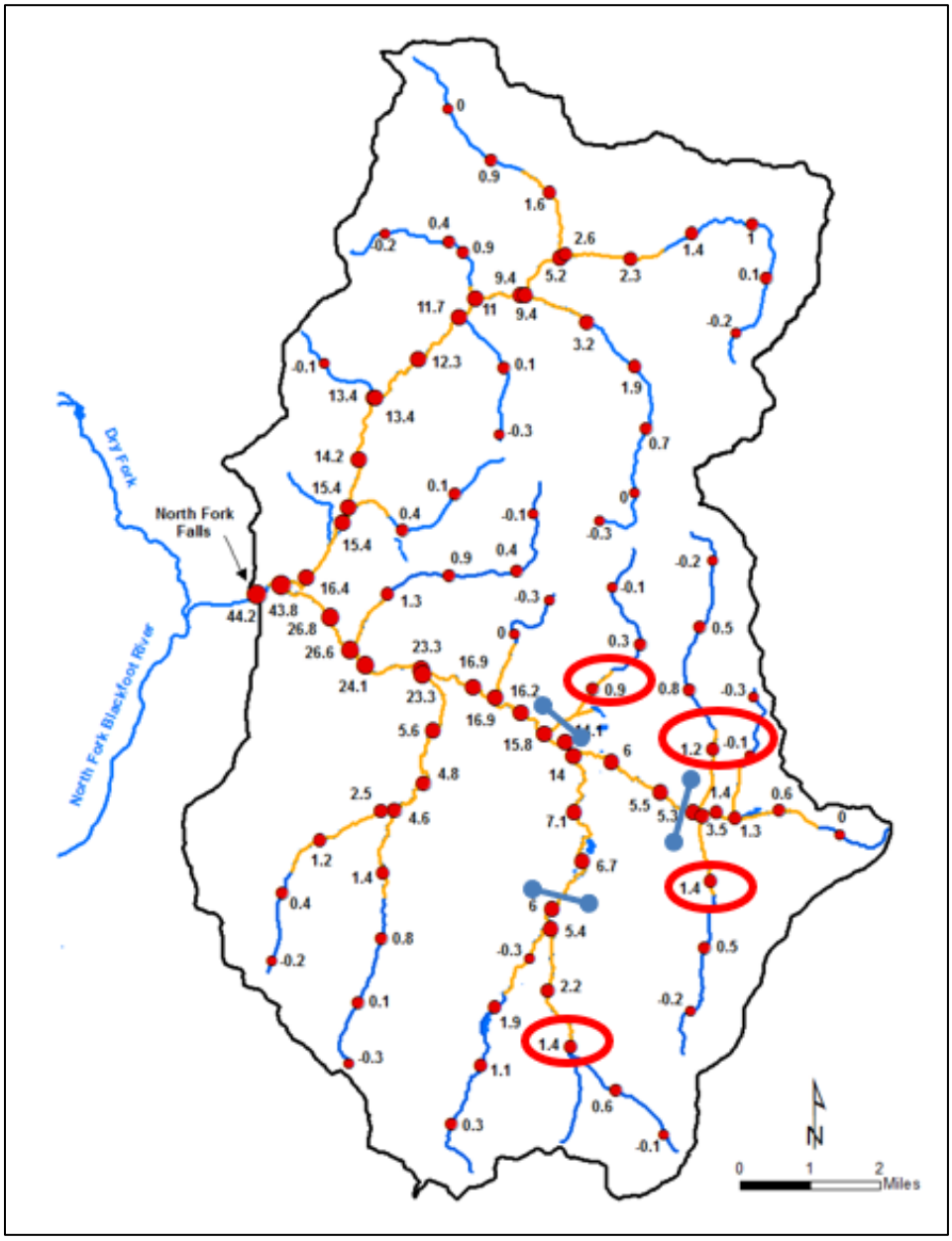

Figure 2. Perennial streams (blue), overlapping distribution of hybrid trout (orange) and estimated stream discharge (red dots with numeric values by stream mile) for the North Fork Blackfoot River drainage upstream of the North Fork Falls. Map is from the estimated budget for the North Fork Project, January 2014. Red ovals show potential sites for bioassays and ground-truthing the fish distribution model; blue bars show potential deactivation sites

The travel time bioassay determines the duration that CFT Legumine remains lethal to fish, which informs spacing of application sites, called drip stations, where the chemical is released in a thin stream. This bioassay entails several actions. A nontoxic, fluorescent green dye applied to streams allows determination of the distance the stream flows within specific reaches over 30 minutes. Replenishing the dye periodically is necessary, as it disperses and dilutes as it travels and loses its visibility. Sentinel fish are deployed at every 30-minute travel time station, typically to the 4-hour travel-time location. A single

drip station dispenses CFT Legumine at a calculated in-stream concentration of 1 ppm for 4 hours. For example, at a site in Figure 2 identified as having a stream discharge of 1.4 cfs, we would apply 570 ml of CFT Legumine over a 4-hour period. The point furthest downstream where 100% of sentinel fish succumb to rotenone within 4 hours exposure is the maximum spacing for drip stations during treatment.

As travel-time bioassays entail release of CFT Legumine into surface water, provisions are necessary to contain the spatial extent of treated waters, so a deactivation station would be set up and ready to operate each time rotenone is applied. This component of the project would be included on FWP's 2018 application to the Montana Department of Environmental Quality (DEQ) for coverage under their Pesticide General Discharge Permit.

The serial-dilution bioassay determines the lowest concentration of CFT Legumine that is lethal to fish within the receiving waters. Fish are held in separate buckets with varying concentrations of CFT Legumine. For example, treatment concentrations may be 0.50, 0.25, 0.13 and 0.065 ppm of CFT Legumine. Guidance in the standard operating procedures (SOPs) manual for rotenone (Finlayson et al. 2010) states a minimum concentration for the full-scale treatment would be double the lowest concentration that kills all fish in the bioassay. Combined, the results of the travel-time and serial-dilution bioassays determine the concentration of CFT Legumine to be applied and the spacing of drip stations, following piscicide SOPs (Finlayson et al. 2010).

The bioassay for potassium permanganate allows calculation of the concentration needed to deactivate 1 ppm of CFT Legumine and meet FWP's requirement of 0.5 to 1 ppm residual potassium permanganate at a point 30 minutes downstream of the deactivation site. A drip station releases sufficient CFT Legumine to achieve 1 ppm of CFT Legumine in the stream. A small deactivation station would be established approximately 10 to 15 minutes stream flow time downstream, and the residual concentration of potassium permanganate would be measured 30 minutes travel time downstream of the deactivation station. The amount of potassium permanganate released that results in the target residual concentration after 30 minutes of contact with CFT Legumine would provide data needed to calculate the quantity of potassium permanganate required for the full-scale treatment.

Ground-Truth Fish Distribution Estimate

Extensive fish population surveys, eDNA sampling, and water temperature monitoring in the North Fork Blackfoot River project area were used to estimate the distribution of fish within the North Fork of the Blackfoot River upstream of the North Fork Falls (Figure 2). These techniques estimated about 45 of the 85 miles of perennial stream habitat support fish. We propose to ground-truth the fish distribution estimates in select streams by applying CFT Legumine at a single point, approximately 1-hour travel time upstream of the estimated extent of fish distribution. If fish are found about where the model predicts, we have high confidence that the estimate is accurate. If fish are found significantly upstream or downstream of the estimated distributions, appropriate adjustments would be made to ensure fish bearing waters would be adequately treated in 2019 and beyond.

Location and Scheduling of Proposed 2018 Field Tasks

Field data allowed estimation the extent of perennial streams and distribution of fish in these waters (Figure 2). We would conduct the bioassays and ground truthing tests near the upper end of streams with low discharge in late July and early August 2018. Conducting this work in the upper end of each stream would allow for transporting the least amount of piscicide and potassium permanganate, as well as the equipment necessary to conduct the tests. Where possible, we would combine the bioassay and ground-truthing by capturing and distributing fish to accomplish both in a single CFT Legumine application. Specifically, if a site allows relatively easy capture and transport of fish, we would carry fish upstream of the estimated extent of fish distribution to serve as sentinel fish for the bioassay. Transported fish would be stationed 30 minutes downstream of the CFT Legumine application point, with additional sentinel fish located at 30-minute increments downstream. If this is feasible, the upstream extent of fish distribution

would be at the 1-hour site with subsequent sentinel sites every 30 minutes downstream as in a standard bioassay.

Conducting the bioassay and ground truthing in small streams would allow for use of more manageable and mobile neutralizing equipment and supplies. We would be able to use a 5- or 10-gallon bucket to apply the potassium permanganate for the deactivation bioassay and for deactivation during the bioassay and ground truthing, if necessary. During these tests we would follow the label recommendations for concentrations for “normal use”. Typically, this concentration is sufficient to cause mortality of trout (Marking and Bills 1976). Determination of the concentration of CFT Legumine needed to reach target concentrations in-stream at each location uses an equation based on stream flow.

Three types of drip station may be used in piscicide projects: 5-gallon water cubes (Figure 3), Montana buckets (Figure 4) and IV bags (Figure 5). Water cube drip stations are equipped with a standing tube with an aperture that releases 5 gallons of CFT Legumine and stream water solution in a thin stream for 4 hours. The Montana bucket is a 3 ½ gallon bucket with a molded plastic elbow coming out of the bottom. A short length of garden hose attached to the plastic elbow leads to an automatic dog watering bowl. A float system in the bowl maintains constant head. A hole drilled in the bottom of the dog bowl delivers CFT Legumine and stream water solution into the stream for 4 hours. Stream water is mixed with the CFT Legumine in both the water cube and Montana bucket system to homogenize the solution and bring each device to its full volume so that it runs for the prescribed duration. The IV bag method entails filling the bag with undiluted CFT Legumine and suspending the bag above the stream. The coiled plastic tubing is adjusted to provide a steady drip into the stream and can be moved up or down to adjust the flow rate. The flow rate is measured using a small graduated cylinder.

Figure 3. A 5-gallon water cube drip station.

Figure 4. Top photo, a Montana bucket piscicide application system. Note sentinel fish in mesh bag upstream of the rotenone application point. Bottom photo, close-up of the Montana bucket system trickling CFT Legumine/stream water solution into a stream. The stream of CFT Legumine and stream water solution is visible in the yellow box.

Figure 5. An IV bag drip station.

The treatment period for the CFT Legumine bioassays would last for an estimated 4 hours, which is the anticipated treatment time that would occur during the actual project. However, if sentinel fish are not exhibiting mortality, or at least adequate signs of distress within a 4-hour exposure, the bioassay may continue for 6 or 8 hours. Once the CFT Legumine application ends, freshwater would begin flowing through the treatment area, flushing the treated water downstream and diluting it. Additionally, the deactivation station would be set up and ready to operate at a point downstream of the bioassay site, should it be necessary to limit the extent of the CFT Legumine toxicity before it naturally degrades to a sub-lethal point. In bioassays conducted for similar projects, rotenone has naturally degraded between 1½ hours and 4 hours. In none of these instances was it necessary to actively deactivate the rotenone.

Detoxification occurs through natural breakdown of the rotenone molecule, dilution from freshwater, and application of an oxidizing compound such as potassium permanganate. Potassium permanganate is a dry crystalline substance that when combined with water readily degrades rotenone. To achieve full detoxification, potassium permanganate must be continuously delivered at a rate such that a residual level of potassium permanganate of 0.5-1.0 ppm is maintained at a site 30 minutes downstream of its application point. This distance is known as the neutralization or deactivation zone. A chlorine meter would be used to monitor the presence of potassium permanganate at the end of the 30-minute contact zone to ensure that 0.5-1.0 ppm potassium permanganate is present, and the rotenone is completely neutralized. In addition, caged fish would be placed in the stream to monitor the effectiveness of the deactivation station. Caged fish would be placed at 30-minute intervals downstream of the deactivation site, likely out to 120 minutes streamflow time and monitored to confirm that deactivation is working properly. Deactivation would continue until the estimated time in which all treated waters have passed the

detoxification site and caged fish placed immediately upstream of the deactivation site can survive without distress for 4 hours.

The FWP piscicide policy (FWP 2012) requires a block net be installed at the end of the deactivation zone to prevent dead fish from drifting downstream of the project area, unless high flows or velocities preclude use of a block net. Flow measurements in streams proposed for bioassays (Figure 2) were less than 2 cfs. By conducting bioassays during low flows, which should be similar flows reported in Figure 2, block nets would be easy to install and maintain during of the bioassay, and dead fish would remain within the streams.

Streams proposed for bioassays are small streams with low density of relatively small fish. Fish density in the proposed streams varied from 0.5 fish/100 ft to 10 fish/100 ft, and none exceeded 9 inches (Pierce et al. 2018). Therefore, bioassays would affect relatively few fish, and these would be left in the stream to keep their nutrients in these nutrient-poor streams. The decaying carcasses would be in relatively remote areas, where recreationalists would be unlikely to encounter them. Rotenone-killed fish do not present a health risk to scavengers (see Fish and Wildlife).

Part II: Environmental Review

A. PHYSICAL ENVIRONMENT

Land Resources

1. LAND RESOURCES Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?		X				
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

Comment
The proposed action would not result in alteration of geologic features, soil, erosional or depositional properties, or expose humans to earthquakes, ground failures, or other natural hazards.

Water

2. WATER Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?			X		YES	2a
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of flood water or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				2f
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?			X		YES	see 2a,f
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				See 2j
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. Will the project affect a designated floodplain?		X				
m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a)			X		YES	2m

Comment 2a
The proposed actions would entail intentional release of a the piscicide CFT Legumine to select tributaries in the East Fork North Fork Blackfoot River (Figure 2). Rotenone was formerly registered as an insecticide for use in organic agriculture and home gardening but is currently registered only as a piscicide. Rotenone comes from the roots and stems from various tropical and subtropical plants in the pea family (Fabaceae). The molecular constituents of rotenone are carbon, hydrogen, and oxygen, and detoxification entails breaking rotenone into these nontoxic components. Rotenone is relatively inexpensive and accessible and is a routine method to remove unwanted fish from lakes and streams. Rotenone acts by blocking a step in cellular respiration.

CFT Legumine is the rotenone formulation proposed for this project. The EPA has registered this formula (Reg. No. 75338-2) and approved its use as a piscicide. Information on its chemical composition, persistence in the environment, and ecological risks come from several sources, including material data

safety sheets (MSDSs) and manufacturer's instructions. (A MSDS is a form detailing chemical and physical properties of a compound, along with information on safety, exposure limits, protective gear required for safe handling, and procedures to handle spills safely.) In addition, Fisher (2007) analyzed the concentrations of major and trace constituents in CFT Legumine, evaluated the toxicity of each, and examined persistence in the environment.

The MSDS for CFT Legumine lists three categories of ingredients for this formula (Table 1). Rotenone comprises 5% of CFT Legumine by weight. Associated resins account for 5%, and the remaining 90% are inert ingredients, of which the solvent n-methylpyrrolidone is a component. Additional information in the MSDS confirms rotenone's extreme toxicity to fish.

Table 1. Composition of CFT Legumine from material safety data sheets (MSDS)

Chemical Ingredients	***Percentage by Weight***	***CAS. No.[1]***	***TLV[2] (units)***
Rotenone	5.00	83-79-4	5 mg/m^3
Other associated resins	5.00		
Inert ingredients including n-methylpyrrolidone	90	872-50-4	Not listed

[1]Chemical abstracts number
[2]A TLV reflects the level of exposure that the typical worker can experience without an unreasonable risk of disease or injury

Analysis of the chemical composition of CFT Legumine found that, on average, rotenone comprised 5% of the formula (Table 2; Fisher 2007), consistent with MSDS reporting. Other constituents were solvents or emulsifiers added to assist in the dispersion of the relatively insoluble rotenone. DEGEE, or diethyl glycol monoethyl ether, a water-soluble solvent, was the largest fraction of the CFT Legumine analyzed. Likewise, n-methylpyrrolidone comprised about 10% of the CFT Legumine. The emulsifier Fennedefo 99™ is an inert additive consisting of fatty acids and resin acids (by-products of wood pulp and common constituents of soap formulations), and polyethylene glycols (PEGs), which are common additives in consumer products such as soft drinks, toothpaste, eye drops, and suntan lotions. Trace constituents included exceptionally low concentrations of several forms of benzene, xylene, and naphthalene. These organic compounds were at considerably lower concentrations than measured in Prenfish, another commercially available formulation of rotenone, which uses hydrocarbons to disperse the piscicide. Their presence in trace amounts in CFT Legumine relates to their use as solvents in extracting rotenone from the original plant material.

Table 2. Average percent concentrations and ranges of major constituents in CFT Legumine (Fisher 2007).

Major CFT Legumine Formula Constituent	***Rotenone***	***Rotenolone***	***n-methylpyrrolidone***	***DEGEE[1]***	***Fennedefo 99***
Average %	5.12	0.718	9.8	61.1	17.1
Range	4.64-5.89	0.43-0.98	8.14-10.8	58.2-63.8	15.8-18.1

[1]diethyl glycol monoethyl ether

Persistence in the environment and toxicity to nontarget organisms are major considerations in determining the potential risks to human health and the environment, and several factors influence rotenone's persistence and toxicity. Rotenone has a half-life of 14 hours at 24 °C, and 84 hours at 0 °C (Gilderhus et al. 1986, 1988), meaning that half of the rotenone is degraded and is no longer toxic in that time. As temperature and sunlight increase, so does degradation of rotenone. Higher alkalinity (>170

mg/L) and pH (>9.0) also increase the rate of degradation. Rotenone tends to bind to, and react with, organic molecules, and availability of organic matter substantially decreases the persistence of rotenone (Dawson et al. 1991). Because this binding inactivates the rotenone, higher rotenone concentrations are required in streams with increased amounts of organic matter.

The concentration of rotenone in treated waters is another factor relating to potential effects from incidental ingestion by other organisms, including humans, which can serve as a proxy for the potential effects on large mammals. The effective concentration of rotenone is 25 to 50 ppb, which is roughly equivalent to ¼ to ½ of a grain of table salt per liter. In contrast, concentrations of 14,000 ppb (1,400 grains of salt per liter) pose no adverse effects to human health from chronic ingestion of water (National Academy of Sciences 1983). Moreover, concentrations associated with acute toxicity to humans are 300-500 mg per kilogram of body weight (Gleason et al. 1969), which means a 160-pound person would have to drink over 23,000 gallons in one sitting to receive a lethal dose (Finlayson et al. 2000). Similarly, risks to wildlife from ingesting treated water are exceptionally low. For example, ¼-pound bird would have to consume 100 quarts of treated water, or more than 40 pounds of fish and invertebrates, within 24 hours, for a lethal dose (Finlayson et al. 2000). The EPA, in their recent reregistration evaluation of rotenone (EPA 2007), concluded that exposure to rotenone, when applied according to label instructions, presented no unacceptable risks to humans and wildlife. In summary, this project would have no adverse effect wildlife that ingest water, dead fish, or dead invertebrates.

Bioaccumulation of rotenone would not result in threats to human health and the environment under the preferred alternative. Rotenone can bioaccumulate in the fat tissues of fish that are exposed to nontoxic levels (Gingerich and Rach 1985). As a complete fish-kill is the goal, and application would occur over 4 to 8 hours, bioaccumulation would not be a problem. Moreover, breakdown of rotenone in killed fish and invertebrates would also be rapid, so scavengers such as skunks, mink, or birds would not experience chronic exposure.

Potential toxicity and persistence of the other constituents of the CFT Legumine formulation are additional considerations. Proposed concentrations of n-methylpyrrolidone (about 2 ppm) would have no adverse effects to humans ingesting treated waters. According to the MSDS, ingestion of 1000 ppm per day for 3 months does not result in deleterious effects to humans. In addition, n-methylpyrrolidone would not persist in surface waters, given its high biodegradability.

Fisher (2007) examined the toxicity and potential persistence of other major constituents in CFT Legumine, including DEGEE, fatty acids, PEGs, and trace organic compounds (benzene, xylene, naphthalene). With proposed application of CFT Legumine, none of these compounds would violate water quality standards, nor would they reach concentrations shown to be harmful to wildlife or humans. Furthermore, persistence of these chemicals was not a concern. The trace organics would degrade rapidly through photolytic (sunlight) and biological mechanisms. Likewise, the PEGs would biodegrade in a few days. The fatty acids would also biodegrade, although they would persist longer than the PEGs or benzenes. However, these are not toxic compounds, so the relatively longer persistence would not adversely affect water quality. The trace organics would be at exceptionally low concentrations, given dilution of the formulation added to the drip station, followed by dilution in the stream. These organic compounds would be well below levels that are harmful. Moreover, these are moderately to highly volatile chemicals that would break down through the same mechanisms as rotenone, namely oxidation, dilution, and treatment with potassium permanganate. Overall, the low toxicity, low persistence, and lack of bioaccumulation indicate the inert constituents in CFT Legumine would have a minor and temporary effect on water quality. Moreover, this planning phase would focus on several, small tributaries, resulting release of CFT Legumine a small fraction of the watershed.

The presence and fate of dead fish would be another potential alteration of water quality associated with piscicide treatment. Dead fish would be left within the stream, so that their decomposition would provide nutrients to promote recolonization of macroinvertebrates.

To control the spatial extent of toxic concentrations of rotenone, FWP's piscicide policy calls for application of potassium permanganate at the downstream end of a project area. This phase of the project would include a bioassay for potassium permanganate to provide data to calculate the concentration of potassium permanganate required to deactivate rotenone. In 2 case studies, potassium permanganate was more toxic to benthic invertebrates than CFT Legumine (Skorupski 2011); however, the spatial extent of exposure is less than 1 hour stream travel time and aquatic invertebrate communities recovered within 1 year. potassium permanganate would not be applied downstream of time-travel bioassays, as the intent is to determine how long rotenone remains toxic. Where applied, potassium permanganate would result in short-term and minor alterations in water quality.

Comment 2f
This project would not alter groundwater quality. Rotenone binds readily to soils and is broken down by soil and in water (Engstrom-Heg 1971; Dawson et al. 1991; Skaar 2001; Ware 2002). Because of its strong tendency to bind with soils, rotenone's mobility in most soil types is only 1 inch; however, rotenone can travel up to 3 inches in sandy soils (Hisata 2002). The combination of low mobility and rapid breakdown prevents rotenone from contaminating groundwater.

Groundwater investigations associated with several piscicide projects also indicate application of rotenone, and the inert ingredients, would not threaten groundwater quality. California investigators monitored groundwater in wells adjacent to and downstream of rotenone projects and did not detect rotenone, rotenolone, or any of the other organic compounds in the formulated products (CDFG 1994). Likewise, case studies in Montana have concluded that rotenone movement through groundwater does not occur. FWP monitored groundwater associated with several rotenone projects, with wells ranging from 65 to 200 feet from the treated waters. Repeated sampling occurred within periods of up to 21 days, with no detectable concentrations of rotenone or the inert ingredients found.

Comment 2j
No irrigation or potable water intakes are present in the North Fork Blackfoot River project area.

Comment 2m
Montana Department of Environmental Quality issues a general pesticide permit to FWP for use of piscicide on a 5-year cycle. This project would be covered under the 2016 Pesticide General Permit. Applicators must develop a pesticide discharge management plan as a condition for coverage by this permit. For FWP, the plan consists of procedures and protocols as prescribed in FWP's piscicide policy (FWP 2012), the American Fisheries Society's standard operating procedures manual (Finlayson et al. 2010), and annual training and critique of projects provided by the FWP piscicide committee. The proposed 2018 fieldwork would occur within the Scapegoat Wilderness and would require a piscicide use permit and zone Minimum Requirements Decision Guide (MRDG; see Appendix) analysis from the U.S. Forest Service (see Appendix).

Air

3. AIR Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Emission of air pollutants or deterioration of ambient air quality? (also see 13 [c])		X				
b. Creation of objectionable odors?			X		yes	3b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Will the project result in any discharge which will conflict with federal or state air quality regs?		X				

Comment 3b
Piscicide treatment has potential to create objectionable odors from chemicals present in the formulation and the presence of decaying fish. Unlike other formulations of rotenone, CFT Legumine does not use organic compounds as solvents and dispersants the nontoxic, and the biodegradable chemicals used for this purpose do not have an objectionable odor. Likewise, the inhalation risk is low, especially with use of personal protective gear. Furthermore, dead fish would result from this project and may cause objectionable odors. However, we expect few fish to be affected and the size of affected fish to be small; therefore, we would expect any detectable odors from dead fish to be short term and minor.

Vegetation

4. VEGETATION Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X			4a
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare, threatened, or endangered species?			X			4c
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X				
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a
The anticipated 2018 work sites are in the upper sections of the East Fork of the North Fork Blackfoot River and its tributaries (Figure 2). Existing U.S. Forest Service trails would be used to access these areas; however, some off-trail hiking would be necessary to access the sites where CFT Legumine would be applied to the streams. We anticipate that 4 or fewer workers would be necessary at each site, and that no more than two round trips from established trails to the test sites would be necessary at each location. Some trampling of vegetation along the stream during the placement and monitoring of drip stations and sentinel fish locations would occur. Rotenone does not affect plants at concentrations used to kill fish. Trampling vegetation would result in short term and minor disturbance and vegetation should be fully recovered within 1 growing season or less.

Comment 4c
The MNHP database lists several plant species of special concern within the Scapegoat Wilderness (Table 3). Review of field guide information in the MNHP database indicates plant species of special concern would experience short-term and minor disturbance, or no disturbance. Rotenone is not toxic to plants, so any disturbance would relate to the presence of field crews. Scorpidium moss is a species of special concern that occurs in the Scapegoat Wilderness, and occupies wet soils in calcareous seeps, fens, bogs, ponds, and other wetlands. Although it has not been documented within the project area, this habitat is present, and taking protective measures is warranted. Trampling by fieldworkers traveling through wetlands would be the only type of disturbance to Scorporidium moss if present. To mitigate for any disturbance, fieldworkers treating areas likely to support this moss would be provided field guide information and would be instructed to take care to avoid trampling Scorporidium moss. Nonetheless, any trampling would be short-term and minor, and the potential for widespread disturbance would be extremely low.

Table 3. Plant species of special concern in the Scapegoat Wilderness.

Class	Scientific Name	Common Name	State Rank	USFS Status
True Mosses	Scorpidium scorpioides	Scorpidium moss	S2	Sensitive
Dicots	Erigeron lackschewitzii	Lackschewitz' Fleabane	S3	Sensitive
Dicots	Cardamine rupicola	Cliff Toothwort	S3	
Dicots	Drosera anglica	English Sundew	S3	Sensitive
Dicots	Drosera linearis	Slenderleaf Sundew	S2	Sensitive
Monocot	Schoenoplectus subterminalis	Water Bulrush	S3	Sensitive
Monocot	Cypripedium passerinum	Sparrow's-egg Lady's-slipper	S2S3	Sensitive

Definitions of Status Codes and Descriptors
S2 = At risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state.
S3 = Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas.
S2S3 = Indicates that populations in different geographic portions of the species' range in Montana have a different conservation status *(e.g., S1 west of the Continental Divide and S4 east of the Continental Divide).*

Two species of sundew have been observed in the Scapegoat Wilderness, but neither have been documented within areas slated for piscicide treatment. These plants occupy fens, which makes them susceptible to trampling during treatment of wetlands. The English sundew would be past its sensitive flowering and fruiting periods during September, the proposed period for project. Slenderleaf sundew has potential to be within its fruiting life-history stage September, which would coincide with piscicide

application. To avoid disturbance to these species, should they be present in the project area, fieldworkers treating wetlands would be provided photos and field guide information to avoid trampling these species of special concern.

Project activities have little to no potential to affect the remaining plant species of special concern. The areas where fieldworkers would be present do not provide habitat for these species. Moreover, project implementation would not coincide with their sensitive life-history stages.

Fish and Wildlife

5. FISH AND WILDLIFE **Will the proposed action result in:**	**Impact Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X		yes	5b
c. Changes in the diversity or abundance of nongame species?			X		yes	5c
d. Introduction of new species into an area?		X				5d
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X			5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				
h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f)		X				
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)		X				

Comment 5b
The work proposed under this EA would result in mortality of Rainbow Trout ×Yellowstone Cutthroat Trout × Westslope Cutthroat Trout hybrids present in the isolated reaches proposed in Figure 2. These streams support low densities of small fish (Pierce et al. 2018). Terrestrial wildlife would be temporarily displaced during the tests, but this disturbance would be short-term and minor. The proposed activities would not have large-scale effects on abundance of aquatic or terrestrial game species.

Comment 5c
Nongame species would experience minor disturbance from the proposed actions. The pilot studies are of limited spatial extent and duration and are restricted to streams in the East Fork North Fork Blackfoot River (Figure 2). Terrestrial wildlife would be temporarily displaced by fieldworkers working, traveling, and

camping in the project area. Otherwise, release of application of CFT Legumine and potassium permanganate would affect aquatic organisms in the treated reaches.

Aquatic Invertebrates

Application of CFT Legumine has potential to adversely affect organisms with an aquatic life history stage. Gilled aquatic invertebrates are nontarget organisms with considerable potential to experience temporary negative effects from piscicide treatment. In streams, benthic populations of true flies, stone flies, mayflies, and caddis flies would be the primary affected taxa. These effects would be short-term and temporary.

Although differences in formulation, concentration, and duration of rotenone treatment complicate making robust predictions of the effects of rotenone on individual taxa, the scientific literature allows for some generalizations. Typically, macroinvertebrate populations experience a marked decrease in abundance and richness, followed by quick recovery of abundance, and richness, or number of species, returns to baseline within 1 year (Skorupski 2011). In one case, no significant reduction in aquatic invertebrates occurred, despite concentrations of rotenone being twice as high as the proposed concentration (Houf and Campbell 1977). In other cases, invertebrates recovered quickly after treatment. For example, after piscicide treatment of a California stream, macroinvertebrates experienced an “explosive resurgence” in numbers, with black fly larvae recovering first, followed by mayflies and caddis flies within 6 weeks after treatment (Cook and Moore 1969). Stone flies returned to pretreatment abundances by the following spring. Because 40 miles of untreated stream would be present upstream of treated stream habitat, recolonization by invertebrate drift would contribute to the rapid recolonization of invertebrate populations following piscicide treatment.

Another mitigative factor is that invertebrates that are most sensitive to rotenone also tend to have short life cycles, and the highest rates of recolonization (Engstrom-Heg et al. 1978). Although gill-respiring invertebrates are a sensitive group, many are far less sensitive to rotenone than fish (Schnick 1974; Chandler and Marking 1982; Finlayson et al. 2010). Short life cycles (Anderson and Wallace 1984), good dispersal ability (Pennack 1989), and generally high reproductive potential (Anderson and Wallace 1984), make aquatic invertebrates capable of rapid recovery from disturbance (Boulton et al. 1992; Matthaei et al. 1996).

The well-documented ability of macroinvertebrates to recover after disturbance, combined with the lower susceptibility of many taxa to rotenone, would contribute to rapid recovery of invertebrate populations. Disturbance is a common occurrence in streams and includes floods, wildfire, and human-caused alterations such as forest roads and incompatible livestock grazing practices (Mihuc and Minshall 1995; Wohl and Carline 1996; Minshall 2003). Human-caused disturbance has greater potential to have long-term effects on stream-dwelling assemblages than piscicide treatments, given longer-term changes in geomorphology, streambed composition, impairment of riparian health and function, and reduced water quality. Rotenone treatment mimics a pulse disturbance, or flood, which is common in streams, and aquatic macroinvertebrates have evolved under a regime of frequent, drastic disturbance.

Larval drift, reproduction by aerial adults, and presence of invulnerable taxa or life history stages are the primary mechanisms of recovery following disturbance. Miles of untreated headwaters would provide a source of recolonization through drift. Likewise, aerial adults that survived rotenone treatment, or colonized from adjacent waters would repopulate streams. Moreover, macroinvertebrates would be in a diverse array of life history stages with varying susceptibility to rotenone, and adults would be able to reproduce soon after treatment. Observers on Lower Deer Creek documented substantial hatches of caddis flies and midges the day following treatment of an area, suggesting these taxa were sufficiently tolerant of rotenone to complete this life stage transition during treatment (C.L. Endicott, FWP, personal communication).

Amphibians

Amphibians are present in streams proposed for treatment and would likely be exposed to rotenone during treatment. Rotenone is lethal to immature amphibians that respire with gills (Grisak et al. 2007;

Billman et al. 2011). Species documented within the project area and likely to occupy stream habitat during the proposed actions include Columbia spotted frogs, western toads, and Rocky Mountain tailed frogs (Pierce et al. 2018).

Effects on stream-dwelling amphibians would be minor to immeasurable. The streams proposed for baseline studies do not provide suitable breeding or rearing habitat for western toad or Columbian spotted frog tadpoles, so these species would be unlikely to be present as sensitive larvae. Metamorphs, juvenile, and adult Columbia spotted frogs do not suffer an acute response to trout-killing concentrations of rotenone (Grisak et al. 2007; Billman et al. 2011). Adult western toads would likely be more resilient than frogs, given their impermeable skin (Maxell and Hokit 1999). All amphibians in the project area can leave the aquatic environment, which would substantially reduce the potential for exposure (Maxell and Hokit 1999). Explosive reproduction following removal of fish, despite near 100% mortality of tadpoles (Billman et al. 2012) indicates Columbian spotted frog populations can withstand or benefit from rotenone treatment. The combination of the ability to withstand concentrations of rotenone used in fish removal projects, and their mobility, means the effects on amphibians would be short term and minor.

Rocky Mountain tailed frogs have the greatest potential for exposure to rotenone, as they are present in streams as gilled tadpoles and take 4 years to metamorphose. Nevertheless, the proposed actions would have minor and temporary effects on Rocky Mountain tailed frogs. The spatial extent of the proposed project is small and relatively few individuals would be exposed. Moreover, field and laboratory studies have found Rocky Mountain tailed frogs to be resilient to rotenone projects (Grisak et al. 2007; Fried et al. 2018). Rocky Mountain tailed frogs are relatively long-lived and several older, rotenone-tolerant generations would be present to recolonize and reproduce. Despite the long gilled-phase, Rocky Mountain spotted frogs quickly develop resistance to rotenone as they mature (Grisak et al. 2007; Fried et al. 2018).

Mammals

Ingestion of rotenone, either from drinking rotenone-treated water or from consuming dead fish or invertebrates from rotenone-treated streams, are the likely routes of exposure for mammals. A substantial body of research has investigated the effects of ingested rotenone in terms of acute and chronic toxicity and other potential health effects. An important consideration in reviewing these studies is that most of the laboratory studies used exceptionally high concentrations of rotenone that would be unattainable under proposed field application. The low level of effects at these super-elevated concentrations indicates that risks to wildlife from exposure to proposed levels would be minor and short-lived, if wildlife experience any effects from ingesting treated water or dead fish and invertebrates.

In general, ingested rotenone does not affect vertebrates because of digestive action in their stomach and intestines (AFS 2002). Investigations examining the potential for acute toxicity from ingesting rotenone find that mammals would need to consume impossibly high amounts of rotenone-treated water or rotenone-killed animals to obtain a lethal dose. For example, a 22-pound dog would have to drink nearly 8,000 gallons of treated water within 24 hours or eat 660,000 pound of rotenone-killed fish within a day to receive a lethal dose (CDFG 1994). A half-pound mammal would need to consume 12.5 mg of pure rotenone or drink 66 gallons of treated water for a lethal dose (Bradbury 1986). In comparison, the effective concentration of rotenone to kill fish is 25 to 50 ppb, which is several orders of magnitude lower than concentrations resulting in acute toxicity to mammals.

Evaluations of mammals' potential exposure to rotenone from scavenging indicate that acute toxicity from ingesting rotenone-killed fish is highly unlikely (EPA 2007). Estimation of the daily consumption of dead fish by an “intermediate-sized mammal” of 350 mg, which is about half the size of a male American mink, estimated a daily dose of 20.3 ppb of rotenone. This is well below the median lethal dose of 13,800 ppb of rotenone for a mammal of that size. A “large mammal” is one with 1,000 g body weight, which is within the weight range for female American mink. If a mammal of that size fed exclusively on fish killed by rotenone, it would receive an equivalent daily dose of 37 ppb of rotenone. In comparison, the estimated median lethal concentration of rotenone for a 1,000 g mammal was 30,400 ppb, which is over 800 times

the daily dose. The EPA (2007) concluded that piscivorous mammals were highly unlikely to consume enough fish to result in acute toxicity.

Chronic toxicity associated with availability of dead fish over time would not pose a threat to mammals, nor would other health effects be likely. Rats and dogs fed high levels of rotenone for 6 months to 2 years experienced only diarrhea, decreased appetite, and weight loss (Marking 1988). The unusually high treatment concentrations did not cause tumors or reproductive problems. Toxicology studies investigating potential secondary effects of rotenone exposure have found no evidence that it results in birth defects (HRI 1982), gene mutations (BRL 1982; Van Geothem et al. 1981), or cancer (Marking 1988). Rats fed diets laced with 10 to 1000 ppm of rotenone over a 10-day period did not experience any reproductive dysfunction (Spencer and Sing 1982). Furthermore, fish decay rapidly after piscicide treatment, and the rotenone also breaks down rapidly, so chronic exposure would not occur.

Studies have linked rotenone to Parkinson's disease (PD); however, examination of the research indicates mammals would not be at risk of developing this neurological disorder from exposure experienced with fish management projects. Inducing PD in the laboratory entailed injection of exceptionally high concentrations of rotenone directly into the bloodstream or brain, under the skin, or into the abdominal cavity, often in conjunction with use of dimethyl sulfoxide (DMSO), a chemical carrier that promotes penetration of rotenone into tissue (Betarbet et al. 2000; Johnson and Bobrovskara 2015). Exposures to high concentrations of rotenone occurred for days to weeks to induce PD-like symptoms.

This exposure bears no resemblance to the mode, duration, and concentration of rotenone exposure wildlife would experience from fisheries management projects, where wildlife would be exposed to rotenone from ingestion of treated water or dead animals. Obviously, injection of rotenone bypasses the digestive tract, which would otherwise deactivate rotenone. DSMO is not applied with rotenone during piscicide treatments, so no carrier to facilitate penetration into tissues would be present. Moreover, the concentration of rotenone in treated surface water is substantially lower than the daily dose of injected rotenone. Reaching the doses found to result in PD-like symptoms in laboratory rodents from subcutaneous injections (Johnson and Bobrovskara 2015) of treated water would require injection of over 15 liters of stream or lake water per day into rats. To achieve the 2 to 3 mg/kg dose of rotenone continuously injected intravenously, with DMSO, rats would require daily injection of 16 to 24 liters of treated stream or lake water for days to weeks.

A temporary reduction in prey of aquatic origin has the potential to influence some mammals. The American mink is the mammalian predator of fish that is most likely to occur in the project area. Mink are opportunistic predators and scavengers, with fish and invertebrates comprising a portion of their diet. Therefore, the reduction in density of fish following treatment may displace mink to adjacent, untreated reaches until fish populations recover. Nonetheless, as opportunists, American mink have flexibility to switch to other prey species and have the ability to disperse.

Other mammalian predators may experience short-term and minor consequences. Opportunistic black bears, raccoons, red foxes, coyotes, otters, and striped skunks would likely consume dead fish immediately after piscicide treatment. The temporary reductions of aquatic prey, and the brief availability of dead fish, constitute short-term and minor effects on mammalian predators and scavengers. Nevertheless, the spatial scale of the pilot studies and low abundance of fish in selected streams would be unlikely to result in a glut of dead fish to scavenge.

Birds

Birds also have potential to be exposed to rotenone through ingestion of treated water or scavenging dead fish and invertebrates. Like mammals, rotenone will break down rapidly within the gut. Moreover, the concentrations of rotenone are far below levels found to be toxic to birds. For example, ¼-pound bird would have to consume 100 quarts of treated water, or more than 40 pounds of fish and invertebrates, within 24 hours, for a lethal dose (Finlayson et al. 2000). The EPA (EPA 2007), concluded that exposure to rotenone, when applied according to label instructions, presented no unacceptable risks to humans

and wildlife. In summary, this project would have no adverse effect wildlife that ingest water, dead fish, or dead invertebrates.

Numerous bird species rely on prey of aquatic origin, and a rotenone project has potential to temporarily decrease forage availability. The proposed actions would be of limited spatial scope, occurring in 4 tributaries, and terrestrial invertebrates would remain unaffected, so local birds would experience a minor, temporary reduction in prey of aquatic origin, if any. Like mammals, birds are highly mobile, so the project may result in short-term displacement of birds that consume fish or aquatic invertebrates.

Reptiles

The proposed actions have an exceptionally low likelihood of affecting reptiles. Reptiles potentially present in the project area include common gartersnakes, terrestrial gartersnakes, and rubber boas. Gartersnakes have potential to exposed to rotenone treated water and will scavenge dead fish. The low concentration and short duration of exposure to rotenone, along with the ability of the reptilian gut to digest hard to digest material like bone, exoskeletons, and hair would make gartersnakes resilient to the proposed actions. Rubber boas are often found near water but are not scavengers and consume terrestrial prey.

Comment 5d

No new species would be introduced as part of this proposed pilot investigation.

Comment 5f

Information on species of concern and threatened and endangered species comes from the Montana Natural Heritage Program's (MNHP) database and field guide, which includes information on species distribution, status, ecology, life history strategies of animals, and sightings throughout the state. This database provided the technical basis for determining potential effects on species of concern. The database includes a comprehensive list of citations to support information presented in the field guide and this document.

Considering the wildness of surrounding country, the project area is within the range of numerous species of concern and species designated as special by the U.S. Forest Service (Table 4). The ranges delineated are broad and may not reflect the suitability of habitat for a given species occurring within the project area. This evaluation focuses on species likely to live and breed in a high elevation, forested, montane environment during the treatment period in July and August, and includes observations of presence of species, evidence of breeding, or other indicators of a species' presence.

As the field studies would occur in small, montane tributary streams, most of the species of concern would not be affected, except for the short-term displacement by fieldworkers, as they are terrestrial or adapted to lentic waters. The species with greater potential for disturbance or conflict with humans are the harlequin duck and grizzly bear. Although unlikely to experience any disturbance other than short-term displacement, this analysis considers all threatened and endangered species.

The MNHP database indicates direct evidence of breeding harlequin ducks in the project area. Harlequin ducks have the life-history strategy of overwintering along coastal, rocky shores of the Pacific Ocean, then flying hundreds of miles inland to breed in high gradient, mountain streams. Males arrive first in early spring and depart in June following breeding. Females arrive later and remain until late July to early September. The potential disturbance to harlequin ducks would be presence of fieldworkers, which would be minor and short-term. The low concentration of rotenone, and the short duration of its occurrence in streams would not present a threat to harlequin ducks.

Grizzly bears are present in the project area. The presence of humans within the project area during the 2018 tests may lead to interactions between grizzly bears and humans. To minimize the potential of bear-human conflicts, all attractants, such as food, garbage, and chemicals associated with fish removal, would be stored in compliance with the relevant food storage order for the Helena-Lewis & Clark National Forest. Because of the current low abundance of hybrid trout in the project area, fish killed through

bioassay and trout distribution tests will not be collected because scavengers and decomposition would quickly eliminate the carcasses.

Table 4: Species of concern, sensitive, and threatened species with ranges overlapping the project area

Class	Scientific Name	Common Name	State Rank	USFS Status
Amphibia	*Anaxyrus boreas*	Western toad	S2	Sensitive
Aves	*Ardea herodias*	Great blue heron	S3	
	Histrionicus histrionicus	Harlequin duck	S2B	Sensitive
	Accipiter gentilis	Northern goshawk	S3	
	Aquila chrysaetos	Golden eagle	S3	
	Picoides arcticus	Black-backed Woodpecker	S3	Sensitive
	Dryocopus pileatus	Pileated woodpecker	S3	
	Nucifraga columbiana	Clark's nutcracker	S3	
	Certhia americana	Brown creeper	S3	
	Troglodytes pacificus	Pacific wren	S3	
	Catharus fuscescens	Veery	S3B	
	Ixoreus naevius	Varied thrush	S3B	
	Leucosticte tephrocotis	Gray-crowned Rosy-Finch	S2B, S5	
	Haemorhous cassinii	Cassin's finch	S3	
	Coccothraustes vespertinus	Evening grosbeak	S3	
Mammalia	*Sorex hoyi*	Pygmy shrew	S3	
	Myotis lucifugus	Little brown myotis	S3	
	Lasiurus cinereus	Hoary bat	S3	
	Synaptomys borealis	Northern bog lemming	S2	Sensitive
	Ursus arctos	Grizzly bear	S2S3	Threatened
	Pekania pennanti	Fisher	S3	Sensitive
	Gulo gulo	Wolverine	S3	Sensitive
	Lynx canadensis	Canada lynx	S3	Threatened
Insecta	Aeshna subarctica	Subarctic darner	S1S2	
	Somatochlora walshii	Brush-tipped Emerald	S1S2	
Snails	Oreohelix alpina	Alpine mountainsnail	S1	
	Oreohelix elrodi	Carinate mountainsnail	S1	

Definitions of Status Codes and Descriptors

S1= At high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.

S2 = At risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state.

S3=Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas.

S2B = an at-risk breeding population, with an S2 ranking

S2S3 = Indicates that populations in different geographic portions of the species' range in Montana have a different conservation status *(e.g., S1 west of the Continental Divide and S4 east of the Continental Divide).*

S5 = Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.

The project site is within the range of the gray wolf, but they are not dependent on fish for food. The impacts to this species, if any, would be minor or short-term. Compliance with the food storage order for the Helena-Lewis & Clark National Forest's food storage order would reduce potential for encounters with wolves. Wolves may incidentally feed on dead fish, which does not present health risks.

Northern bog lemmings live in a variety of habitat types, including wet meadows, fens, and bogs. Northern bog lemmings consume moss, sedge, grass, and some invertebrate species. No wet meadows, fens or bogs would be affected during the 2018 tests. The reduction of invertebrate prey in the test zones would be short-term and minor, although vegetation, the main component of their diet, would not be affected.

Two bat species of concern have been documented in the Scapegoat Wilderness, the hoary bat and least brown myotis. A reduction in aerial invertebrates with aquatic larval stages could result in reduced prey base; however, both species consume invertebrates of terrestrial origin as a large part of their diet. The temporary reduction in invertebrates of aquatic origin would be short-term and minor.

B. HUMAN ENVIRONMENT

Noise and Electrical Effects

6. NOISE/ELECTRICAL EFFECTS **Will the proposed action result in:**	**Impact Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Increases in existing noise levels?		X				
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

Land Use

7. LAND USE Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflict with a designated natural area or area of unusual scientific or educational importance?			X			7b
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?	X					7c
d. Adverse effects on or relocation of residences?		X				

Comment 7b
The proposed actions in 2018 would occur within the Scapegoat Wilderness area. Application of a piscicide in the waters in designated wilderness area would require evaluation from the U.S. Forest Service, and the results would be issued through completion of a zone Minimum Resource Decision Guide (MRDG; see Appendix) analysis of the potential impacts on wilderness character or values.

Comment 7c
Application of CFT Legumine would limit the use of treated streams during the investigations. The label for CFT Legumine requires no recreational access to treated waters and placement of placards warning the public that piscicide is in use. The length of time the treated streams would remain closed to the public until CFT Legumine had flushed through the stream, which would be from 3 to 4 hours.

The project is proposed for a period when backpackers and day-hikers, campers, anglers and other recreationists may be using the area. Generally, the proposed actions would be conducted in small streams away from established trails and campsites. Only these local areas will be closed during the rotenone testing, not the entire East Fork North Fork Blackfoot River drainage.

Risk and Health Hazards

8. RISK AND HEALTH HAZARDS Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		YES	8a
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?			X		YES	8b
c. Creation of any human health hazard or potential hazard?			X		YES	see 8a,c
d. Will any chemical toxicants be used?			X		YES	see 8a

Comment 8a
The principal risk of human exposure to hazardous materials from this project would be limited to the applicators. All applicators would wear safety equipment required by the product labels and MSDS sheets. All applicators would be trained on the safe handling and application of the piscicide and potassium permanganate. Piscicide applicators would require certification through the Montana Department of Agriculture to apply piscicide. Beyond this, FWP imposes additional requirements on its own employees through its internal piscicide policy (FWP 2012). An independent certified applicator must accompany each treatment, with “independent” status assigned to an individual who would not be expected to work on the treatment as part of their normal duties. Therefore, at least 2 Montana Department of Agriculture certified pesticide applicators would supervise and administer the project. Materials would be transported, handled, applied and stored according to the label specifications to reduce the probability of exposure or a spill.

Comment 8b
FWP requires a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear chain of command, training, delegation and assignment of responsibility, clear lines of communication between members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by FWP the risk of emergency response is minimal and any effects to existing emergency responders would be short term and minor.

Comment 8c
Risks to human health relate to exposure to rotenone, the inert ingredients of the CFT Legumine, or to the potassium permanganate used in detoxifying rotenone. Information examined here includes an analysis of human health risks relating to rotenone exposure (Table 5 [in present paper]; EPA 2007), MSDS sheets for chemicals used, and an evaluation of the chemical constitution of the CFT Legumine formula (Fisher 2007). Toxicity and persistence of the inert ingredients are reviewed in detail in the analysis presented in the analysis of the effects on water, and these ingredients do not pose a threat to human health.

Acute toxicity refers to the adverse effects of a substance from either a single exposure or multiple exposures in a short space of time. Rotenone ranks as having high acute toxicity through oral and inhalation routes of exposure, and low acute toxicity through exposure to skin (EPA 2007). Acute toxicity would be applicable to undiluted CFT Legumine, with median lethal doses for rats ranging from 39. 5 mg/kg for female rats, and 102 mg/kg for male rats. A male rat would need to ingest or inhale 40 mg of

undiluted rotenone for a lethal dose. As rotenone is 5% of most rotenone formulations, exposure to acutely toxic concentrations is not possible, and use of personal protective equipment will further mitigate for potential exposure.

Table 5: Toxicological endpoints for rotenone (EPA 2007)

Exposure Scenario	**Dose Used in Risk Assessment, Uncertainty Factor (UF)**	**Level of Concern for Risk Assessment**	**Study and Toxicological Effects**
Acute Dietary (females 13-49)	NOAEL = 15 mg/kg/day UF = 1000 aRfD = 15 mg/kg/day = 0. 015 mg/kg/day 1000	Acute PAD = 0. 015 mg/kg/day	Developmental toxicity study in mouse (MRID 00141707, 00145049) LOAEL = 24 mg/kg/day based on increased resorptions
Acute Dietary (all populations)	An appropriate endpoint attributable to a single dose was not identified in the available studies, including the developmental toxicity studies.		
Chronic Dietary (all populations)	NOAEL = 0. 375 mg/kg/day UF = 1000 cRfD = 0. 375 mg/kg/day = 0. 0004 mg/kg/day 1000	Chronic PAD = 0. 0004 mg/kg/day	Chronic/oncogenicity study in rat (MRID 00156739, 41657101) LOAEL = 1. 9 mg/kg/day based on decreased body weight and food consumption in both males and females
Incidental Oral Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day	Residential MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day [M/F] based on decreased parental (male and female) body weight and body weight gain
Dermal Short-, Intermediate-, and Long-Term	NOAEL = 0. 5 mg/kg/day 10% dermal absorption factor	Residential MOE = 1000 Worker MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day
Inhalation Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day 100% inhalation absorption factor	Residential MOE = 1000 Worker MOE = 1000	[M/F] based on decreased parental (male and female) body weight and body weight gain
Cancer (oral, dermal, inhalation)	Classification; No evidence of carcinogenicity		

UF = uncertainty factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, aPAD = acute population adjusted dose, cPAD = chronic population adjusted does, RfD = reference dose, MOE = margin of exposure, NA = Not Applicable

Chronic exposure is repeated oral, dermal, or inhalation of the target chemical (EPA 2007). In humans, chronic exposure is the length of time equivalent to approximately 10% of the life span. In piscicide treatments in streams, application occurs over 4 or 5 days. Therefore, the only people likely to experience chronic exposure are the applicators who dispense diluted CFT Legumine over multiple projects. The use of protective eyewear, gloves and dust/mist respirators (in the case of hand held devices that dispense rotenone) is sufficient to protect worker health.

The analysis of dietary risks considered threats to the subgroup “females 13-49 years old” and examined exposure associated with consuming exposed fish and drinking treated surface water (EPA 2007). In determining potential exposure from consuming fish, the EPA used maximum residues in fish tissue. The concentrations of residue considered were conservative, meaning that they may have been an overestimate of the rotenone concentrations in muscle tissue, as they included unpalatable tissues, where concentrations may be higher. The EPA concluded that acute dietary exposure estimates resulted in a dietary risk below the EPA’s level of concern; therefore, consumption of fish killed by rotenone does not present an acute risk to the sensitive subgroup.

The EPA considered chronic dietary risks relating to exposure through drinking water. Chronic exposure from consuming exposed fish was not evaluated, given rotenone’s rapid degradation and low propensity to bioaccumulate in fish. Based on the chronic toxicity endpoint, the drinking water level of concern was 40 ppb, which addressed effects on infants and children, the most sensitive population subgroup. The effective concentration for fish eradication is 25 ppb to 50 ppb but would be of short duration, which would not allow chronic ingestion of treated water. Signs alerting the public to the presence of rotenone-treated water would further reduce the probability of ingestion by humans.

In evaluating the potential for chronic exposure to rotenone, the EPA acknowledged the rapid degradation of rotenone in the environment and that expediting deactivation with oxidizing agents, such as potassium permanganate was a standard procedure in many projects. The EPA concluded that no chronic exposures to rotenone would occur where water is treated with potassium permanganate or subjected to an oxidative water treatment regime. The water in the streams proposed for this project are not a source of domestic water.

Concern over a potential link between rotenone and Parkinson’s disease often emerges in piscicide projects. Research into links between rotenone and PD include laboratory studies intended to induce PD-like symptoms in laboratory animals as a tool for neuroscientists to conduct PD-related research (Betarbet et al. 2000; Johnson and Bobvraskaya 2015), epidemiological studies of PD in farm workers (Kamel et al. 2006; Tanner et al. 2011), and laboratory studies evaluating risks associated with inhalation (Rojo et al. 2007). Laboratory studies inducing PD-like symptoms do not provide a relevant model for field exposure by humans. These studies entail injection of extremely high concentrations of rotenone, often with a chemical carrier to facilitate absorption into tissue, for considerably longer durations than piscicide projects.

Epidemiological studies do not provide clear evidence that rotenone has a causal link with PD, have flaws in the study design, and do not reflect potential for exposure for fieldworkers working on piscicide projects (Finlayson et al 2012). These studies evaluate PD in farmworkers, but do not control for type or duration of exposure or use of personal protective equipment and rely on self-reporting, which is subject to error. Farmworkers generally applied rotenone powder, whereas piscicide in current use is in liquid form. In piscicide projects, the use of personal protective equipment is sufficient to protect applicators (EPA 2007). Laboratory studies of risks associated with inhalation of rotenone of concentrations likely encountered by fieldworkers have not found PD-like symptoms in exposed rodents (Rojo et al. 2007).

Rotenone has been used by indigenous people for centuries to kill fish for food. Some native South Americans extract rotenone by chewing the stems or roots of *Timbó*, a rotenone parent plant, then swim into lagoons to distribute the pulp (Teixeira et al. 1984). The traditional method of applying rotenone from root does not involve a calculated target concentration, metering devices or involve human health risk

precautions as those involved with fisheries management programs. No harmful effects have been reported for any native peoples using rotenone across the southern hemisphere, where diverse groups have discovered its utility in obtaining fish for food.

Community Impact

9. COMMUNITY IMPACT **Will the proposed action result in:**	**Impact Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

Public Services/Taxes/Utilities

10. PUBLIC SERVICES/ TAXES/ UTILITIES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify:		X				
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased used of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs		X				

Aesthetics and Recreation

11. AESTHETICS AND RECREATION Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)			X		no	11c
d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c)		X				

Comment 11c
The scale and scope of the proposed bioassays and fish distribution testing is minor and will be unlikely to affect recreational use of the area. The test areas would be off-trail, and each test reach would be used for 1 or 2 days, by no more than 4 workers. The likelihood of recreationalists using the East Fork North Fork Blackfoot River drainage entering the remote test reaches is low.

Cultural/Historical Resources

12. CULTURAL/ HISTORICAL RESOURCES Will the proposed action result in:	Impact Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				12c
d. Will the project affect historic or cultural resources?		X				

Comment 12c
Project leaders have met and communicated the objectives and methods of the proposed North Fork Project to Salish and Kootenai Tribal leaders, who expressed their support for the project.

To date there have been no cultural or religious resources identified at the project site. There will be no ground-breaking activities associated with this project, and no known cultural or religious ceremonies proposed for the same time this project is proposed. There will be no impacts to historical, cultural or religious values.

Summary Evaluation of Significance.

13. SUMMARY EVALUATION OF SIGNIFICANCE **Will the proposed action, considered as a whole:**	**Impact Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?	X	X			yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)	X	X				13f
g. List any federal or state permits required.						13g

Comments 13e and f
The use of pesticides can generate controversy from some people. Public outreach and information programs can educate the public on the use of pesticides. It is not known if this project would have organized opposition.

Comment 13g
The following permits would be required:

- MDEQ Pesticide General Permit
- US Forest Service Pesticide Use Permit
- US Forest Service zone MRDG review (see Appendix)

Recent changes to the U.S. Forest Service Manual (Region 1) describe the USFS policy on piscicide use by state agencies and permits needed in designated wilderness. Forest Service Manual Amendment 2100-2014-1 states that although federal regulations at 36 CFR 261.9(f) require that special use authorization be obtained for any use of pesticides that affect Forest Service lands, most applications by state agencies will generally meet the criteria for a waiver from the permits as set forth in 36 CFR 251.50(e)(1) & (2). The exception to this is the use of pesticides in wilderness areas, where it will be necessary to obtain a Pesticide Use Permit and the Minimum Requirement Decision Guide (MRDG), which are issued by the Regional Forester. Because of this federal nexus, there are accompanying requirements to ensure NEPA compliance as part of the permitting process. This extra step will take time and FWP biologists should therefore begin coordinating with the Forest Service on which the treatment will occur as early as possible.

Part III: Alternatives Considered

Alternative 1 – No Action

Under the no action alternative there would be no bioassays or ground-truthing of the fish distribution estimates in 2018. Failure to conduct these rotenone tests in 2018 would not preclude the proposed North Fork Blackfoot River Native Fish Restoration Project from occurring. The restoration project is not being evaluated in this EA but will be evaluated in a separate EA. If the proposed field tests are not conducted in 2018 they will necessarily be conducted later should the native fish restoration proceed.

Alternative 2 – Conduct bioassays and fish distribution testing in 2018 using a liquid rotenone formulation and a neutralizing agent, potassium permanganate (Proposed Action)

The proposed action involves applying a liquid rotenone formulation, likely CFT Legumine, and potassium permanganate at several sites in the East Fork North Fork Blackfoot River drainage on the Helena-Lewis & Clark National Forest in 2018. The Restoration Project is anticipated to be implemented in 2019.

Conducting the proposed rotenone and potassium permanganate bioassays and fish distribution tests in 2018 would provide information that would facilitate planning for the restoration project. Results of the tests would provide information that would help refine estimates of the quantity of liquid rotenone formulation and potassium permanganate necessary for the restoration project and help establish the upstream limits for rotenone application. Without this information, if the restoration project proceeds, the quantity of piscicide and potassium permanganate needing to be transported into the area would not be based on actual test data, which would likely lead to transporting significantly more of each than necessary to ensure an adequate supply.

Alternative 3 – Conduct bioassays and fish distribution testing in the same year the restoration project is implemented using a liquid rotenone formulation and a neutralizing agent, potassium permanganate

This alternative would provide the same information as the proposed action but would not be timely for planning for the restoration project These tests would need to be done 2-4 weeks before the restoration project begins; however, arrangements for purchasing CFT Legumine and potassium permanganate need to be made months in advance. Personnel commitments similarly would have to be made months in advance. Therefore, to plan for the uncertain results from the tests, it would likely require purchasing more chemicals than needed and arranging for more personnel than will be needed.

Alternative 4 – Conduct only serial dilution bioassays in 2018.

This alternative would meet the CFT Legumine label requirements for bioassays, but would provide no information toward estimating fish distribution, drip station spacing or concentration of potassium permanganate necessary to deactivate the rotenone. In this alternative, potassium permanganate deactivation stations below the bioassay and fish distribution test sites would likely not be necessary as all treated waters could be contained within test buckets.

Part IV: Public Comment

A **public meeting** will be held on June 6, 2018 at the Hilton Garden Inn (Bitterroot Room; 3270 North Reserve) in Missoula at 6:30 p.m., to explain the project, answer questions, and take public testimony.

Public review of and comment on this project is encouraged, and the 30-day **public comment period** will begin May 30 and comments must be received no later than June 28, 2018.

The draft EA will be posted on FWP's website (http://fwp.mt.gov (under "News," choose "Recent Public Notices") beginning May 30, 2018, along with the opportunity to submit comments online.

Submit written comments on the website above or to:

Sharon Rose
FWP Region 2
3201 Spurgin Road
Missoula, MT 59804
(406) 542-5540
shrose@mt.gov

Literature Cited

AFS (American Fisheries Society). 2002. Rotenone stewardship program, fish management chemicals subcommittee. www.fisheries.org/rotenone/.

Anderson, N. H. and J. B. Wallace. 1984. Habitat, life history, and behavioral adaptations of aquatic insects. Pages 38-58 in R. W. Merritt and K. W. Cummins (eds), An introduction to the aquatic insects of North America. 2nd ed. Kendall/Hunt Publishing, Dubuque, Iowa.

Betarbet, R., T.B. Sherer, G. MacKenzie, M. Garcia-Osuna, A.V. Panov, and T. Greenamyre. 2000. Chronic systemic pesticide exposure reproduces features of Parkinson's disease. Nature Neuroscience 3 (12): 1301-1306.

Billman, H.G., C.G. Kruse, S.St-Hilaire, T.M. Koel , J. L. Arnold, and C.R. Peterson. 2012. Effects of Rotenone on Columbia Spotted Frogs Rana luteiventris during Field Applications in Lentic Habitats of Southwestern Montana, North American Journal of Fisheries Management 32:4, 781-789

Billman, H.G., S. St-Hilaire, C..G..Kruse, T.S. Peterson and C.R. Peterson. 2011. Toxicity of the Piscicide Rotenone to Columbia Spotted Frog and Boreal Toad Tadpoles, Transactions of the American Fisheries Society, 140: 919-927.

Boulton, A. J., C. G Peterson, N. B. Grimm, and S. G. Fisher. 1992. Stability of an aquatic macroinvertebrate community in a multiyear hydrologic disturbance regime. Ecology. 73 (6):2192-2207.

Bradbury, A. 1986. Rotenone and trout stocking: a literature review with special reference to Washington Department of Game's lake rehabilitation program. Fisheries management report 86-2. Washington Department of Game.

BRL (Biotech Research Laboratories). 1982. Analytical studies for detection of chromosomal aberrations in fruit flies, rats, mice, and horse bean. Report to U.S. Fish and Wildlife Service (USFWS Study 14-16-0009-80-54). National fishery research Laboratory, La Crosse, Wisconsin.

CDFG (California Department of Fish and Game). 1994. Rotenone use for fisheries management, July 1994, final programmatic environmental impact report. State of California Department of Fish and Game.

Chandler, J.H. and L.L. Marking. 1982. Toxicity of rotenone to selected aquatic invertebrates and frog larvae. The Progressive Fish Culturist 44(2) 78-80.

Cook, S.F. and R.L. Moore. 1969. The effects of a rotenone treatment on the insect fauna of a California stream. Transactions of the American Fisheries Society 83 (3):539-544.

Dawson, V. K., W. H. Gingerich, R. A. Davis, and P. A. Gilderhus. 1991. Rotenone persistence in freshwater ponds: effects of temperature and sediment adsorption. North American Journal of Fisheries Management. 11:226-231.

Engstrom-Heg, R, R. T. Colesante, and E. Silco. 1978. Rotenone tolerances of stream-bottom insects. New York Fish and Game Journal. 25 (1):31-41.

Engstrom-Heg, R. 1971. Kinetics of rotenone-KMnO4 reactions as applied to the protection of trout streams. New York Fish and Game Journal vol. 19 no. 1:47-58.

EPA. 2007. United States Environmental Protection Agency, prevention, pesticides and toxic substances (7508P). EPA 738-R-07-005. Reregistration Eligibility Decision for Rotenone, List A Case No. 0255.

Finlayson, B. J., R. A. Schnick, R. L. Cailteux, L. DeMong, W. D. Horton, W. McClay, C. W. Thompson, and G. J. Tichacek. 2000. Rotenone use in fisheries management: administrative and technical guidelines manual. American Fisheries Society, Bethesda, Maryland.

Finlayson, B., R. Schnick, D. Skaar, J. Anderson, L. Demong, D. Duffield, W. Horton, and J. Steinkjer. 2010. Planning and standard operating procedures for the use of rotenone in fish management—rotenone SOP manual. American Fisheries Society, Bethesda, Maryland.

Fisher, J.P. 2007. Screening level risk analysis of previously unidentified rotenone formulation constituents associated with the treatment of Lake Davis. *for* California Department of Fish and Game. Environ International Corporation, Seattle.

FWP. 2012. Piscicide Policy. Montana Fish, Wildlife & Parks, Fisheries Bureau, Helena, Montana.

Gilderhus, P. A., V. K. Dawson, and J. L. Allen. 1988. Deposition and persistence of rotenone in shallow ponds during cold and warm seasons. US Fish and Wildlife Service Investigations in Fish Control, No. 5.

Gilderhus, P.A., J.L. Allen, and V.K. Dawson. 1986. Persistence of rotenone in ponds at different temperatures. North American Journal of Fisheries Management. 6: 129-130.

Gingerich, W. and J. Rach. 1985. Uptake, accumulation and depuration of 14C-rotenone in blue gills (*Lepomis macrochirus*). Aquatic Toxicology 6:170-196.

Gleason, M., R. Gosselin, H. Hodge, and P. Smith 1969. Clinical toxicology of commercial products. The William and Wilkins Company, Baltimore, Maryland.

Grisak, G.G., D. R. Skaar, G. L. Michael, M.E. Schnee and B.L. Marotz. 2007. Toxicity of Fintrol (antimycin) and Prenfish (rotenone) to three amphibian species. Intermountain Journal of Sciences. Vol. 13, No.1:1-8.

Hisata, J. S. 2002. Lake and stream rehabilitation: rotenone use and health risks. Final supplemental environmental impact statement. Washington Department of Fish and Wildlife, Olympia. Washington.

HRI (Hazelton Raltech Laboratories). 1982. Teratology studies with rotenone in rats. Report to U.S. Geological Survey. Upper Midwest Environmental Sciences Center (USFWS Study 81-178). La Crosse, Wisconsin.

Houf, L. J. and R. S. Campbell. 1977. Effects of antimycin a and rotenone on macrobenthos in ponds. Investigations in fish control number 80. U. S. Fish and Wildlife Service. Fish Control Laboratory, LaCrosse, Wisconsin.

Johnson, M. E. and L. Bobrovskaya. 2015. An update on the rotenone models of Parkinson's disease: Their ability to reproduce the features of clinical disease and model gene-environment interactions. Neurtoxicity 46:101-116.

Kamel, F., C. Tanner, D. Umbach, M. Alavania, A. Blair, K. Comyns. S. Goldman, M. Korell, J. Langston, and D. Sandler. Pesticide exposure and self-reported Parkinson's disease in the agricultural health study. American Journal of Epidemiology 165:364-374.

Marking, L.L. 1988. Oral toxicity of rotenone to mammals. Investigations in fish control, technical report 94. U.S, Fish and Wildlife Service, National Fisheries Research Center, La Crosse, Wisconsin.

Maxell, B. A., and D. G. Hokit. 1999. Amphibians and Reptiles. Pages 2. 1-2. 29 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307pp.

Matthaei, C. D., Uehlinger, U., Meyer, E. I., Frutiger, A. 1996. Recolonization by benthic invertebrates after experimental disturbance in a Swiss pre-alpine river. Freshwater Biology. 35(2):233-248/

Marking, L.L., and T.D. Bills. 1976. Toxicity of rotenone to fish in standardized laboratory tests. Investigations in fish control number 72. U.S. Fish and Wildlife Service. Fish Control Laboratory, LaCrosse, Wisconsin.

Mihuc, T. B. and G. W. Minshall. 1995. Trophic generalists vs. trophic specialists: implications for food web dynamics in post-fire streams. Ecology 76(8):2361-2372.

Minshall, G. W. 2003. Responses of stream benthic invertebrates to fire. Forest Ecology and Management. 178:155-161.

National Academy of Sciences NAS. 1983. Drinking water and health, volume 5. Safe Drinking Water Committee Board of Toxicology and Environmental Health Hazards, Commission on Life Sciences, National Research Council, National Academy Press, Washington D. C.

Pennack, 1989. Freshwater Invertebrates of the United States, John Wouldey & Sons and Company, New York, New York.

Pierce, R., C. Podner, and P. Saffel. 2018. Aquatic and associated investigation to guide conservation planning for Bull Trout and Westslope Cutthroat Trout in the North Fork Blackfoot River upstream of the North Fork Falls, 202-2017. Montana Fish, Wildlife & Parks. Missoula, Montana.

Rojo, A. I. C. Cavada, M. R. de Sagarra, and A. Cuadrado. 2007. Chronic inhalation of rotenone or paraquat does not induce Parkinson's disease symptoms in mice or rats. Experimental Neurology 208:120-126.

Schnick, R. A. 1974. A review of the literature on the use of rotenone in fisheries. USDI Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, LaCrosse, WI.

Skaar, D. 2001. A brief summary of the persistence and toxic effects of rotenone. Montana Fish, Wildlife & Parks, Helena.

Skorupski, J. A. 2011. Effects of CFT Legumine™ Rotenone on Macroinvertebrates in Four Drainages of Montana and New Mexico. Master of Science (Biology), University of North Texas, August 2011, 150 pp.

Spencer, F. and L.T. Sing. 1982. Reproductive responses to rotenone during decidualized pseudogestation and gestation in rats. *Bulletin of Environmental Contamination and Toxicology* 228:360-368.

Tanner, C.M., F. Kamel, W. Ross, J.A. Hoppin, S.M. Goldman, M. Korell, C. Marras, G.S. Bhudhikanok, M. Kasten, A.R. Chade, K. Comyns, M.B. Richards, C. Meng, B. Priestley, H.H. Fernandex, F. Cambi, D.M. Umbach, A. Blair, D.P. Sandler, and J.W. Langston. 2011. Rotenone, paraquat, and Parkinson's disease. Environmental Health Perspectives 119:866-872.

Teixeira, J.R.M., A.J. Lapa, C. Souccar, and J.R. Valle. 1984. Timbós: ichthyotoxic plants used by Brazilian Indians. Journal of Ethnopharmacology 10:311-318.

Ware, G.W. 2002. An introduction to insecticides 3rd edition. University of Arizona, Department of Entomology, Tuscon. *on* EXTOXNET. Extension Toxicology Network. Oregon State University web page.

Wohl, N. E. and R. F. Carline. 1996. Relations among riparian grazing, sediment loads, macroinvertebrates, and fishes in three Pennsylvania streams. Canadian Journal of Fisheries and Aquatic Sciences. 53:260-266.

Zoecon. 2015. Product label for CFT Legumine. Central Life Sciences. http://www.zoecon.com/-/media/files/zoecon-na/us/product%20labels/specimen/cft%20legumine%20fish%20toxicant%20specimen%20label.pdf.